MIFACE INVESTIGATION: #05MI046

SUBJECT: Lawn Technician Dies When Pinned Between Motorized Spreader Handles and Roof of Work Van

SUMMARY: On April 12, 2005, a 36-year-old male lawn technician was killed while unloading a motorized gas-powered, ride-on, granular fertilizer spreader from the back of an extended van. He was pinned between the handles on the spreader and the interior roof of the van. The ride-on spreader had four rubber tires, a riding platform consisting of metal slats and wheels, and an adjustable handle with a throttle control and brake. The victim used an extended van with ramps to transport the spreader from job to job (See Figure 1). The event was unwitnessed. Based on a conversation with the operations manager and one of his coworkers, the following scenario was developed. The victim entered the van and moved the handle to a position where he could maneuver the spreader out of the van. After starting the spreader and placing it into reverse, and while standing on the van floor, the victim may have somehow unintentionally hit the throttle. This could have caused the spreader to move suddenly and pin him to the roof of the van. Or, while he was backing the machine out, he was unaware of his location in relation to the upper doorjamb. He struck the doorjamb with his back. The machine continued to move in reverse. The spreader handles, which had been released, moved upward and pinned him against the interior roof with his feet suspended in the air. Due to his position, he was unable to change the gear from reverse to either neutral or forward. The right wheel of the riding platform slipped off the inside of the right ramp and the left rear wheel remained inside the van. The homeowner first saw the lawn care van in the street in front of her home approximately 9:00 a.m. She left approximately one hour later to run some errands and saw the victim leaning over the machine but thought he was working on it. She did not notice if the victim's feet were on the floor. When she returned approximately one hour later, she saw that the van had not been moved and the victim had not moved and was pinned between the roof of the van and the spreader handles. She called 911 when she saw the victim's position. Emergency response arrived and transported the victim to a local hospital where he was declared dead.

Figure 1. Van with sprayer and ramps leading to ground

RECOMMENDATIONS

- Employers should review equipment transportation methods to eliminate equipment loading/unloading procedures that pose a hazard to the operator.
- Employers should ensure that employees follow written safe procedures for loading and unloading mobile machines from transport vehicles.
- Employers should ensure that aftermarket trailers or other accessory installation on a

Key Words: Machine-related, landscaping

commercial vehicle comply with State and/or Federal Motor Carrier Safety Administration (FMSCA) rules.
- Operators should stand on the outside of the vehicle and wear appropriate personal protective equipment while filling sprayer reservoirs with liquid pesticides.
- Equipment manufacturers should consider the use of engineering controls to eliminate operating positions that expose workers to hazards of tight clearance.

INTRODUCTION

On April 12, 2005, a 36 year-old male lawn technician was killed when he was caught between the van roof and the handle of his riding spreader. On April 13, 2005, MIFACE investigators were informed by the Michigan Occupational Safety and Health Administration (MIOSHA) personnel who had received a report on their 24-hour-a-day hotline (1-800-858-0397) that a work-related injury had occurred on April 12, 2005. On June 6, 2005, the MIFACE researcher interviewed the company owner and coworker of the victim. The company owner accompanied the MIFACE researcher to a job site so she could observe the riding spreader and how the spreader was loaded into and unloaded from a van. The company owner permitted MIFACE to take pictures of the van and the riding spreader. During the course of writing the report, the police report and pictures, medical examiner's case report, and MIOSHA citations and file were reviewed. Figure 1 and Figure 4 were taken by the responding police agency at the scene. The MIFACE researcher took the pictures used as Figures 2, 3, 5 and 6 at the time of the site visit.

The company fertilized and applied pesticides to lawns, trees and shrubs. They have 47 employees of which 12 have the same job title as the victim, lawn tech. The employer has been in business for about five years. The victim was an hourly employee, worked full time, and had been employed for approximately three weeks. He worked eight-hour days and his day usually began at approximately 7:00 a.m. The victim had approximately nine years of experience in applying fertilizers and pesticides, and was a State of Michigan certified pesticide applicator.

Personal protective equipment that was commonly worn consisted of cloth gloves and work boots. The employer did not have a written health and safety program. All of the company's lawn technicians are Certified Pesticide Applicators. The company did not have health and safety committee at the site. Safety meetings were scheduled with employees on an "as necessary" basis. There was no written disciplinary procedure in place for health and safety policy violations.

The victim was trained by another employee to operate the machine and apply the company – supplied fertilizers and pesticides. An experienced lawn care technician trained all employees. The trainer indicated to company management that the employee had demonstrated competence before the employee was allowed to work independently. The victim had been trained using this procedure and had demonstrated to his trainer that he knew how to inspect and safely operate the equipment, as well as safely apply fertilizer and pesticides. The victim had been working independently for approximately two weeks. The company followed the spreader manufacturer's recommended repair and maintenance schedule. The victim had made 155 service calls for his employer in the previous two weeks.

At the conclusion of their investigation, MIOSHA issued the following Other citation to the employer: The company did not report the work-related fatality orally within eight hours to the Michigan Department of Labor and Economic Growth, Michigan Occupational Safety and Health Administration as required by the Recordkeeping and Reporting of Occupational Injuries and Illnesses, Part OSH 11, Rule 1139(1).

INVESTIGATION

The victim was using a Perma-Green Supreme Robin 6.0 model, gas powered, clutch driven, ride-on sprayer-spreader. (The sprayer/spreader will be referred to as spreader for this report). The company bought this machine new in 2002. The spreader had a handle release, a clutch, gearshift, throttle, and brake. The machine was equipped with an attached riding platform for the operator. (See Figure 2) The machine could be operated as a walk-behind as well as a riding machine. To convert it to a walk-behind, the operator pulled the handle release lever and stepped backwards off the riding platform while pulling the handle down.

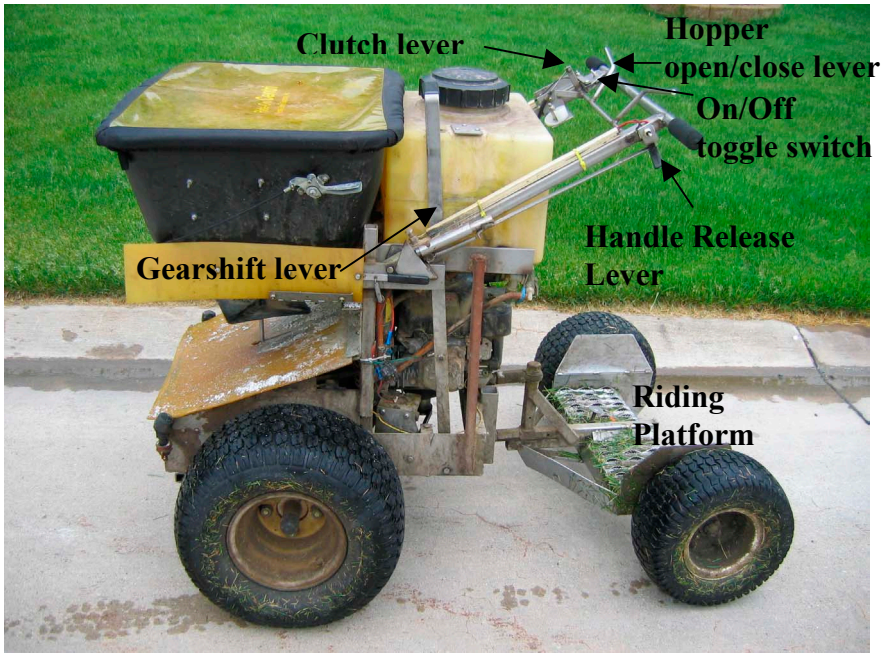

Figure 2. Ride-on spreader/sprayer

An extended van transported the ride-on spreader and the chemicals used for the lawn work. The van had a sliding door on the passenger side and was equipped with two foldable ramps at the rear doors. The inside height of the van was 53 inches from floor to ceiling. The rear opening measured 49 inches from floor to van frame. With the spreader handle raised to its highest position, the height of the machine was approximately 13 to 14 inches from the van interior roof. The transport van shown in Figure 3 is a standard size van, not an extended van.

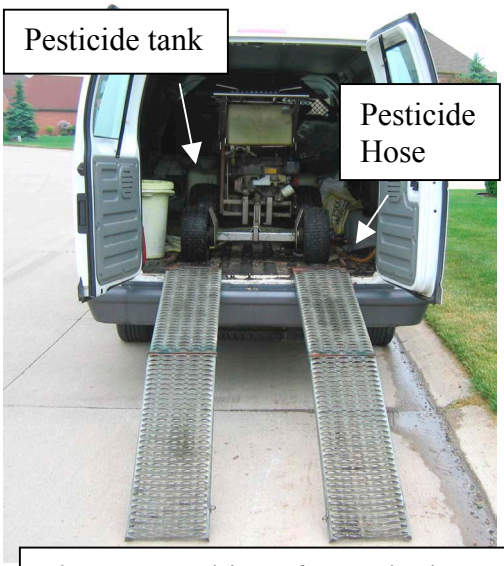

Figure 3. Position of spreader in standard size van prior to unloading

The two foldable ramps allowed the machine to be placed

into and removed from the transport van. The unwritten procedure to unload the machine from a standard size van was as follows: To remove the spreader, the operator opened the back doors and pulled down the ramps. The operator shifted the spreader transmission into neutral, pulled the machine back about three to four inches to the back of the van, turned the machine on by activating a toggle switch, placed the machine in reverse, and started the spreader with the pull cord. The operator would then exit the van, move the handles down, and pull and hold the clutch lever. The machine could then be backed down the two unloading ramps. Reverse gear was the farthest forward position followed by neutral. To load the spreader, the machine was maneuvered up the ramps and placed against the pesticide storage tank anchored on the van floor (See Figure 3).

The incident site was his first job of the day. He arrived at work at 7:00 a.m. and left the company headquarters at 8:15 a.m. The machine had been loaded into an extended van. The pesticide tank was anchored in relatively the same position as a standard size van; behind the front seats. The extended length required the machine to be placed further into the van's interior. This made it virtually impossible to step outside of the van to unload the machine down the ramps after starting it.

The hopper had not yet been filled with granular fertilizer. It appeared that he was in the process of unloading the spreader from the back of the extended van when he became pinned between the handles of the spreader and the roof of the van. When the responding police arrived they noted that the spreader engine switch was in the "on" position, and the engine was not running although there was still gas in the tank. The gear selector was in the reverse position. They also noted that there were scrape marks on the tires and the van floor, which indicated that the machine had been running but eventually stalled out. Fresh rubber powder was observed in line with the tire and metal ramp tie down bar. The spreader's rear right wheel was hanging between the two ramps. Its left rear wheel was still inside the van. (See Figure 4) A torn work glove was hanging from the handle of the machine. The van was still running, idle speed.

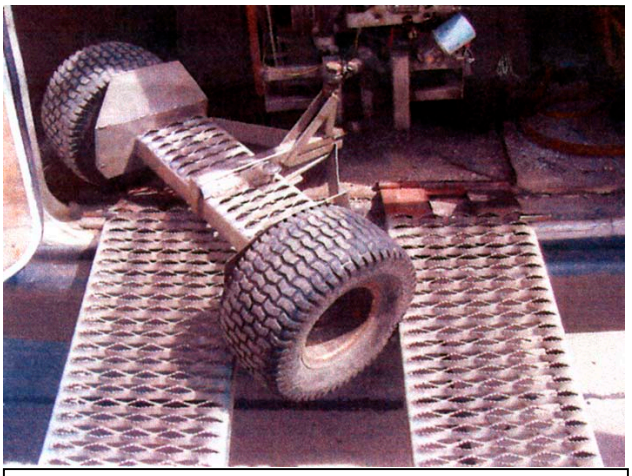

Figure 4. Position of rider platform tires outside of van

The victim was partially hanging out of the rear door with his feet suspended in the air. The spreader handles were against his chest, pinning him to the interior roof of the van. It is unknown exactly how the incident occurred. He may have released the spreader handles so that they would move up and down to enable him to maneuver the machine more easily. After starting the spreader and placing it into reverse, and while standing on the van floor, the victim may have unintentionally hit the throttle causing the spreader to move suddenly, causing the handle to flex upward and pin him to the roof of the van. Or, while he was backing the machine out, he was unaware of his location in relation to the doorjamb. He struck the doorjamb with his back and could not move out of the way quickly enough. The machine, continued to move in reverse, causing the handle to move upward and pin him. It was

not possible to be standing on the machine when backing it out because there was only 13 inches to 14 inches of clearance between the handle when raised and the top of the vehicle.

The homeowner first saw the lawn care van in the street in front of her home approximately 9:00 a.m. She left approximately one hour later to run some errands and saw the victim leaning over the machine but thought he was working on it. She did not notice if the victim's feet were on the floor. When she returned approximately one hour later, she saw that the van had not been moved and the victim was pinned. She called 911 when she saw the victim's position.

Responding police entered the van through the side doors and pulled the machine forward to free him from his position. They began CPR. Emergency response arrived, transported him to a local hospital where he was pronounced dead of chest injuries.

The operations manager escorted the MIFACE researcher to the location where the employee who trained the victim was working. The van transporting the same type of spreader was a standard length van. This employee demonstrated the procedure he taught the victim to unload the spreader from the van. A possible factor in this incident is that the van the victim was using was an extended length van instead of a standard length van. He could not reach the handle of the spreader while standing on the outside of the van due to the position of the spreader against the pesticide tank and the van's length.

The MIFACE researcher observed the victim's trainer fill the machine with pesticide while the spreader was in the van. To do this operation, the employee was required to lean over the handles to maneuver the pesticide hose to the spreader's reservoir (See Figure 3). It is unknown whether the spreader's pesticide tank the victim was using had been filled. Another possible scenario is that while the victim was filling the spreader's pesticide tank, he may have unknowingly caught his glove or he bumped his arm against the gearshift and inadvertently moved the gearshift to the reverse position. When he started the machine while inside of the van, the machine moved and he was pinned.

CAUSE OF DEATH

The cause of death as determined by the medical examiner was chest compression. A contributory cause was arteriosclerotic heart disease. Toxicology was negative for alcohol and drugs.

RECOMMENDATIONS/DISCUSSION

- Employers should review equipment transportation methods to eliminate loading/unloading procedures that pose a hazard to the operator.

Figure 5. Trailer on back of work van

The cargo van used in this incident was of sufficient size to allow for transport of the persons, equipment, and materials to the job site. However, the available clearance between the van body and the spreader may be insufficient for routine safe loading and unloading from inside of the van. It is possible to safely unload the machine while remaining outside the confines of the cargo body. The pull rope for the recoil starter as well as the operating controls is accessible from outside the van. When the handle was raised to its most vertical position, vertical clearance from the top of the handle to the ceiling was approximately 13-14 inches. When evaluating the size and configuration of transport vehicles for mobile machinery, safe loading and unloading must be considered. In this instance, a van having a larger cargo body or door opening, or an open-top vehicle, may have offered increased clearance and safety.

The company has reviewed the use of a van to transport the spreader/sprayers and is currently retrofitting their work vans and pickup trucks (as shown in Figures 5 and 6) to minimize the hazard of placing the employee in a confined space with the equipment. Figure 5 shows the retrofit installation of a hitch/trailer combination on the back of a company van. This combination has a full ramp to load and unload the spreader on the trailer. Figure 6 shows the retrofit installation of a "basket system" for the equipment at the rear of a company pickup truck. Depending upon the configuration of the trailer, it may be possible to anchor the pesticide tank or other type of tank to the trailer and thus keep the tank on the outside of the vehicle.

Figure 6. Basket mounted on pickup truck

Another option for transport would be the installation of floor stops to position the unit at the rear of the van in a position that would not allow the worker any area to step in the van.

- Employers should ensure that employees follow written safe procedures for loading and unloading mobile machines from transport vehicles.

The employer had unwritten procedures for transporting, loading, and unloading the spreader in a van. These procedures were intended for standard size vans. The victim was not using a standard size van, but an extended length van. The pesticide tank was anchored in relatively the same position

as a standard size van; behind the front seats. The victim was required to start the machine from inside the van and also begin the unloading of the machine while standing within the van's interior. As he was attempting to unload the machine from the inside, he may not have comprehended his proximity to the doorjamb and/or van roof. An employer's development of written procedures reinforces management's commitment to safety and ensures uniformity of the procedures among the workforce. While conversion of all company vehicles is taking place, MIFACE recommends that the company develop written procedures for loading and unloading the spreader/sprayer. These procedures should require the operator to remain outside the van.

- Employers should ensure that aftermarket trailers or other accessory installation on a commercial vehicle comply with State and/or Federal Motor Carrier Safety Administration (FMSCA) rules.

The employer should ensure that the trailers shown in Figures 5 and 6 comply with the Michigan Motor Vehicle Code (MVC). A commercial motor vehicle under the Michigan MVC includes "all motor vehicles used for the transportation of passengers for hire, or constructed or used for transportation of goods, wares or merchandise, and/or all motor vehicles designed and used for drawing other vehicles and not so constructed as to carry any load thereon either independently or any part of the weight of a vehicle or load so drawn". The vans and pickup trucks used by the company qualify as commercial motor vehicles under the Michigan MVC and therefore are subject to Michigan MVC requirements.

Michigan MVC Sec. 686 states that "motor vehicles, trailers ….shall be equipped with at least one rear lamp mounted on the rear, which, when lighted as required by this act, shall emit a red light plainly visible from a distance of 500 feet to the rear". Figure 6 shows the basket added to the rear of one of the company's pickup truck. The configuration of the basket's vertical ramp obscures the pickup's right rear taillight. If the equipment loaded obscures the other pickup taillight, the company would be in violation of the Code and a possible violation could be issued

The trailer in Figure 5 and the basket in Figure 6 must be equipped with at least one rear lamp mounted on the rear, which, when lighted, shall emit a red light plainly visible from a distance of 500 feet to the rear (MVC Sec. 686(1)). When the spreader is placed on the trailer or basket platforms, the spreader may obscure the rear registration plate. According to Section 686(2), the registration plate must be clearly legible from a distance of 50 feet to the rear.

The weight of the trailers in Figures 5 and 6 were unknown. If the trailers had a gross weight in excess of 3,000 pounds, the Michigan MVC requires that the trailer have:

- On the front, two clearance lamps, one at each side;
- On each side, two side marker lamps, one at or near the front and one at or near the rear;
- On each side, two reflectors, one at or near the front and one at or near the rear;
- On the rear, two clearance lamps, one at each side, also two reflectors, one at each side and one stop light.

The Michigan MVC (Sec. 693) also requires that whenever the load upon any vehicle extends to the

rear four feet or more beyond the bed or body of the vehicle, there shall be displayed at the extreme rear end of the load, from a half hour after sunset to a half hour before sunrise and at any other time when there is not sufficient light to render clearly discernible persons and vehicles on the highway, a red light or lantern plainly visible from a distance of at least 500 feet to the sides and rear. The red light or lantern shall be in addition to the red rear light required upon every vehicle. At any other time there shall be displayed at the extreme rear end of such a load a red flag or cloth not less than 12 inches square and so hung that the entire area is visible to the driver of a vehicle approaching from the rear.

- Operators should stand on the outside of the vehicle and wear appropriate personal protective equipment while filling sprayer reservoirs with liquid pesticides.

The MIFACE researcher observed the employee at the worksite fill the sprayer reservoir with the pesticide hose while not wearing a respirator, chemical protective gloves, or apron and while standing within the confines of the van interior. The pesticide reservoir tank is anchored to the van floor behind the front seats, and is equipped with a hose and nozzle that can reach to the back of the van. The limited work area, diminished light, and limited operator maneuverability inside of the van may increase the potential for a spill as well as increase the concentration of the pesticide vapors in the air and increase employee exposure to the pesticide. Appropriate personal protective equipment as recommended by the pesticide manufacturer will reduce the potential of employee exposure. When possible, an employee should stand outside of the vehicle while filling the pesticide reservoir. Standing outside will reduce the potential for spills and pesticide concentration in the breathing zone of the employee, both of which should reduce employee exposure.

- Equipment manufacturers should consider the use of engineering controls to eliminate operating positions, which expose workers to hazards of tight clearance.

It should be possible to equip the machine in this incident with starting controls, which would facilitate starting the engine from outside the cargo van. The machine could be equipped with an electric starter to allow the machine to be key-switch started while remaining outside the van. Alternatively, the handle for the starter's pull rope could be re-positioned to the handlebar support so that it could be accessed from outside the van. This position would be similar to the arrangement of modern walk-behind lawn mowers that allow the operator to pull the starter rope while standing behind the mower. Also, the application of a "dead man" control to the handlebars, similar to that currently incorporated in walk-behind lawn mowers, should be considered. Similar protection might be offered by interlocking the ignition with the drive control to prevent the engine from starting while the drive control was engaged. Any of these devices could offer redundant protection to safe operating procedures.

RESOURCES

MIOSHA standards cited in this report may be found at and downloaded from the MIOSHA, Michigan Department of Labor and Economic Growth (DLEG) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Labor and Economic Growth, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

DLEG MIOSHA Recordkeeping and Reporting of Occupational Injuries and Illnesses, Part OSH 11, Rule 1139(1).

NIOSH FACE Report #9812. Fence Technician Pinned Inside Cargo Van by Line Laying Machine—North Carolina. Fatality Assessment and Control Evaluation Team, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH, 1095 Willowdale Road, M/S 1808, Morgantown, West Virginia 26505-2888
Internet Address for NIOSH FACE: http://www.cdc.gov/niosh/face/facecont.html
Internet Address for cited report: http://www.cdc.gov/niosh/face/In-house/full9812.html

Federal Motor Carrier Safety Administration (FMCSA). 400 7th Street SW, Washington, DC 20590.
Internet Address: http://www.fmcsa.dot.gov/

Michigan Motor Vehicle Code, Act 300 pf 1949, Chapter VI, Obedience to and Effect of Traffic Laws.
Internet Address: http://www.legislature.mi.gov/mileg.asp?page=GetObject&objName=mcl-Act-300-of-1949

11/04/05

MIFACE
Investigation Report # 05 MI 046
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To improve the quality of the MIFACE program and our investigation reports, we would like to ask you a few questions regarding this report.

Please rate the report using a scale of:

Excellent	**Good**	**Fair**	**Poor**
1	2	3	4

What was your general impression of this MIFACE investigation report?

Excellent	**Good**	**Fair**	**Poor**
1	2	3	4

Was the report…	**Excellent**	**Good**	**Fair**	**Poor**
Objective?	1	2	3	4
Clearly written?	1	2	3	4
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Practical?	1	2	3	4
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How will you use this report? (Check all that apply)

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Thank You!

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